

# Field Camp Operations

## Field Camp Safety

Field camp installations involve a certain amount of risk. Dynamic conditions exist across four possible platforms: ship, small boat, surf zone, and on shore. The weather, wind, sea state, and sea ice are all factors and each can change rapidly over the course of an installation or removal.

The safety of all members of the party is paramount. Discuss safety with the entire field team before arriving at camp, and revisit the field safety plan after camp is established.

- Develop a general emergency plan.
- Discuss how it should be implemented in different types of situations the team could encounter.
- Discuss any job or camp hazards before initiating any work.
- Discuss methods of incident and injury prevention.
- Make risk mitigation a daily strategy and discussion topic.
- Emphasize the importance of staying safe, given the remoteness of the research location.
- Be certain everyone is familiar with the use of all communication equipment, and set up a schedule to check the equipment throughout the time at camp.
- Encourage field team members to be their own advocate and bring attention to any safety issues they observe, regarding both work and camp operations.
- Encourage team members to watch out for each other's safety and well-being.

All field team members have the right to stop any operation if they observe something unsafe.

## Extreme Cold Weather Clothing

It is imperative to stay warm and dry in Antarctica. This is especially critical in a Peninsula field camp, where the weather is characterized by cold, wet conditions and there isn't a quick or easy way to dry clothing or get warm. The marine environment on the Peninsula experiences, on average, 28 inches of rain annually and temperatures from -40°F to +40°F.

The standard USAP clothing issue includes two types of waterproof garments. One is a water resistant/waterproof breathable shell for working on land. The second is a non-breathable, PVC rain jacket

and bib pant. The PVC gear is generally preferred by researchers spending a fair amount of time working from small boats, where one is likely to get soaked from sea spray, or by those working on land in wet and muddy conditions.

Layering underneath the water resistant/waterproof layers is important. The insulating layers should be synthetic (polypropylene, for example) or wool. Unlike cotton, these garments will not lose their insulating properties if they get wet. Layering is especially helpful when the weather or the level of physical work is apt to change. One may add or shed a layer as needed to manage body heat. Avoid sweating, since wet clothing promotes heat loss through evaporative cooling. If a long walk and/or extended labor is required, and conditions warrant, stop to remove some layers. In short, it is vital to wear:

- A wind and water proof outer layer (shell);
- Warm insulating layers (fleece); and
- A wicking layer (base layer/long underwear).

Goggles are provided, and personal, glacier-rated sunglasses are strongly recommended. These protect eyes from sun and wind, and they help prevent snow blindness (see the First Aid section).

## Footwear

Keeping feet dry is essential to keeping them warm. It may be necessary to change socks during the day. Feet and socks get damp or wet through sweat or from stepping in deep water when exiting a small boat or walking in a stream, and post-holing through snow can allow snow to enter boots. It may be prudent to carry a second pair of boots in case one becomes wet. Wearing gaiters can prevent snow and mud from entering boots.

Personnel on the Peninsula are issued steel-toed, rubber work boots. Steel-toed boots are required when working on the deck of the research vessel. It is recommended that researchers wear the issued rubber boots when boating and during shore landings and change to hiking boots for shore work.

Dry feet and socks thoroughly each night. Avoid starting the day with wet socks or boots.

## Gloves and Mittens

Bring a variety of gloves and mittens. Waterproof rubber or neoprene gloves are essential for small boat activities (which could be wet) and warm, dry ones are needed on shore. It is helpful to have

several spares of a variety of gloves and mittens, since they may get wet during the day.

## Small Boat Ride Clothing

No amount of careful preparation for a shore expedition will be helpful if you get soaked during the ride ashore. It's best to think about dressing for two different situations: the clothing needed to stay dry and warm in the boat (sometimes for a considerable length of time) and the clothing needed to stay warm onshore.

All outer layers need to be waterproof when in a small boat: boots, pants, jacket, and gloves. Almost as important to what is worn is how it is worn. Waterproof gloves will be useless if they fill with water because they aren't tucked into a jacket sleeve, and the waterproof jacket will be no comfort if the hood is not worn and a wave splashes through the neck opening.

Since waterproof layers are not very breathable, it's often best to shed them once arriving ashore to prevent getting wet from sweat.

## Camp Put-In

Before deploying to the field, project personnel should carefully review camp put-in, daily tasking, and camp pull-out checklists.

Before field deployment, the entire project team must test all VHF field radios and Iridium phones and review the communications plan with the MPC and vessel captain or Palmer Station manager. All team members must know how to use the equipment and know where emergency phone numbers are stored.

Planning and flexibility are crucial to a successful installation. Before the operation, the vessel MPC and field camp manager will hold a meeting with all involved parties, outline the operation, and assign roles. ASC personnel and grantees will fill many of these roles.

On the day of the operation, the captain, MPC, lead marine technician, chief scientist, and field camp manager will meet to discuss the viability of the operation in view of the forecast, current weather, sea conditions, and ice conditions. If the decision is made to attempt an installation, the full team is mobilized.

During the installation, all parties will continue to monitor environmental conditions and the safety of the operation. If weather deteriorates, the attempt will be abandoned and all personnel recalled until conditions abate and another attempt can be made.

## Loading Cargo from Small Boat to Shore

Camp put-ins will require multiple trips in small boats operated by ASC marine technicians. Prioritize cargo so items are offloaded in the appropriate order. Field team members must ensure all essential, life-sustaining supplies and equipment are on the first boat, in case deteriorating weather or ocean conditions prevent a complete camp put-in. This includes radios and satellite phones, sleep kits, stoves, matches, extra clothing, tents, and enough food, fuel, and water for an extended period. Field teams must be flexible and develop risk mitigation plans.

### Calm Conditions/Bow-In Landings

If there are calm conditions and an appropriate beach, the bow of the boat can be brought up to the sand, rocks, or snow/ice berm. That way, gear can be passed from the boat directly onto dry land. Personnel should be positioned so that gear can be passed hand-to-hand over any wet, rocky, or icy ground, or any treacherous footing. Arrange people where they can exercise proper lifting technique, avoiding twisting and jerking movements.

### Surf or Stern-To Landings

In surf or stern-to landings, people in immersion suits will need to be in the water to help control the boat and offload cargo. Offloading over the stern is more difficult, as the engine is in the way. Often, the best option is to have two people steady the boat while others pass cargo over one side of the boat near the stern and through a chain of people to safe ground.

### Moving Cargo from Shore to Camp

Gear can be piled on shore before being sorted, carried, or sledged to the final campsite. The first priority is getting the boat unloaded; the faster this happens, the quicker the boat can return to the ship for another load. This is especially important where there is a great distance between the ship and the shore. Also, there is a finite weather window on most operations on the Peninsula, so the more expediently everything gets ashore, the greater the likelihood of a complete and successful installation.

### Tasks Before Vessel Can Depart

During camp put-in and before the vessel departs, the field team must make radio or Iridium phone contact with the vessel or Palmer Station. The team must also erect a tent for shelter and test a cook

stove. The most efficient way to do this is to split the team into two groups, each with a defined task.

## Campsite Location

When selecting a campsite, field team members should follow ACA protocols, as well as the regulations for ASMAAs and ASPAs, if relevant. These details should have been discussed during the planning process for each project.

Specific campsite selection should address any concerns that came up during the planning process. Field team members should also be aware of the flora and fauna in the proposed camp area, the area topography, and camp logistics. The Peninsula field supervisor can assist with site selection.

## Wildlife, Vegetation, Sensitive Areas

Participants should not interfere with wildlife unless they have an ACA permit and a specific reason to do so. Consider camp location in relation to seabird nests and colonies, paths for penguins walking to and from the ocean, and haul out/resting areas for seals. Consider any existing vegetative ground cover (mosses, grasses, lichens) and avoid trampling and disturbing it as much as possible. Avoid camping in areas that drain into sensitive sites (streams, ponds, lakes, nesting areas). At the end of the field season, disassemble any rock cairns and leave the area in its original state.

## Topography and Weather

Consider the lay of the land and how storms will impact the camp. Choosing areas with physical features that block the wind can be ideal, but be aware that leeward sites will accumulate snow. Consider how meltwater or rainwater may enter camp or accumulate in low spots. Be aware of tide lines, glacier walls that could calve at any time, and rock fall hazards.

In addition, select an area where topography does not interfere with VHF radio and Iridium phone communications. This will be particularly important if you have an emergency.

## Travel Time Between Research Site and Boat Landing

The research location and the small boat landing site can also play a role in camp selection. Erecting camp closer to the research location will reduce walking commute time.

Conversely, it may be best to establish camp as close to the put-in area as possible (keeping in mind the above considerations) in order to maximize the efficiency (and perhaps the safety) of the put-in/pull-out process. Identify alternative boat landing sites in case weather or ocean conditions during camp pull-out are different from those during camp put-in (i.e., different wind and wave action may prohibit boat landings at previously used sites). These factors may play a role in determining the best location for the camp.

## Camp Layout

The layout of camp can be discussed ahead of time and adjusted once actual conditions are observed, taking into consideration the above mentioned factors (wildlife, vegetation, sensitive areas, topography, weather, safety, logistics). Consider where to erect tents (berthing, kitchen/meeting), establish a bathroom area (with or without tent), store outside gear, and establish an emergency cache. Discuss camp layout with regard to possible white-out conditions, taking into account obstacles between tents and the feasibility of erecting rope lines between berthing, kitchen, and bathroom tents.

## Survival Cache and Emergency Shelter

A survival cache should be set up a short distance from camp (200-300m upwind) in case the main tent with food and supplies is destroyed by fire or a storm. The cache should contain a basic assortment of survival gear, with the minimum amount of each item determined by the number of people in camp and how remote the location is. It is imperative that this cache be anchored securely and the items kept dry.

The survival cache could consist of just the red survival bags issued by the Peninsula field supervisor. These would be supplemented with a radio and batteries, water bottles, and other crucial items specific to the field team. The bags can be stashed in a cave, anchored to the ground, or buried in snow and flagged.

If the need arises for an emergency shelter, the first and most important order of business is to arrange for protection from the wind. Soon after arriving, spend some time looking around the camp and research locations for physical features that provide a break from the prevailing wind and could be used in case of an emergency. Identifying those locations ahead of time might be crucial. Erecting rock walls or snow walls, digging snow trenches, building other types of snow shelters, or erecting makeshift shelters out of piles of

gear and tarps are all options for staying out of the wind, snow, and rain in an emergency.

## Shelters

Tents should have a solid anchor for every guy line, and these should be checked daily to ensure they are tensioned. Loose guy lines make the tent more prone to wind damage, and they make catastrophic failures in a storm more likely. “Hard” knots should be avoided. Instead, use taut-line hitches or trucker’s hitches, as they are easy to undo. Field team members should practice and become familiar with these knots before deploying.

### Establishing Wind Direction

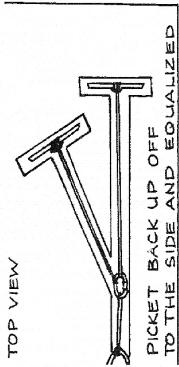
The most important factor in setting up a tent is securely anchoring it to withstand high winds. Field teams should first determine the prevailing wind direction by observing patterns in the snow or sand. Long rows of snow drifts (sastrugi) in, for example, a north-south orientation will indicate that the prevailing wind is either from the north or south. Next, look for etching at the ends. If the prevailing wind is from the south, the snow at the southern end of the sastrugi will be etched.

Orient the tent with the main door opening downwind but at a 45-degree angle to the prevailing wind. This will help prevent drifting that blocks the door, and it will best shed the windload.

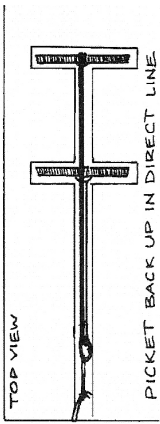
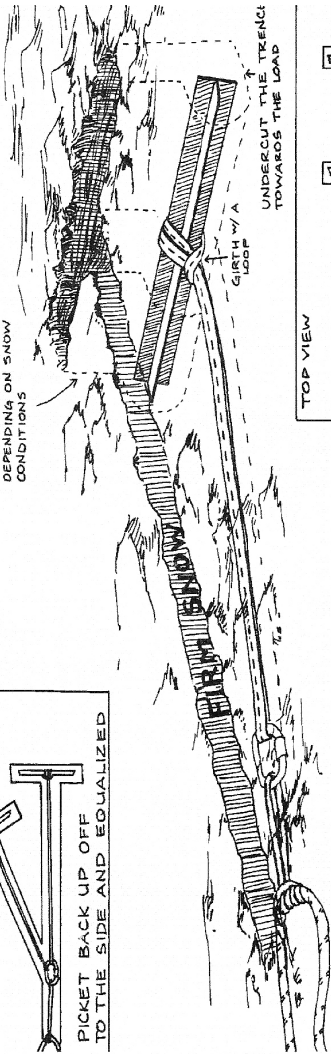
### Anchoring the Tent

Anchoring techniques differ based on snow, ice, soil, and sand conditions. If the surface is hard-packed, hammer in long stakes or sections of bamboo, angled slightly away from the tent, and attach guy lines to these. If the surface is soft, bury a long stake or piece of bamboo (“deadman”) in a slot perpendicular to the angle of pull (refer to illustration below), with a guy line attached at the mid-point. The guy line should run in a straight line from the deadman to the tent, via a slot cut in the snow. The deadman should not be buried too close to the tent or it will be pulled upward when the line is tensioned. In very soft snow, the deadman anchor should be buried two feet deep or more. If enough metal or bamboo stakes are not available, cloth rock bags or other biodegradable items can be filled with sand or snow and buried.



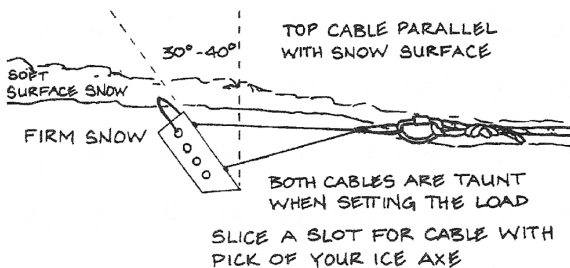


18" AVERAGE DEPTH DEPENDING ON SNOW CONDITIONS



DEADMAN SNOW PICKET ANCHOR

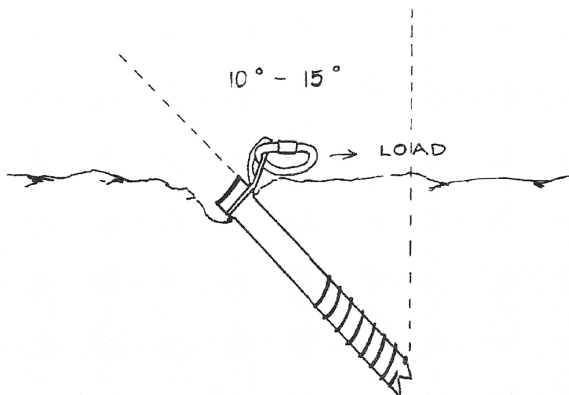
## SNOW FLUKE ANCHOR



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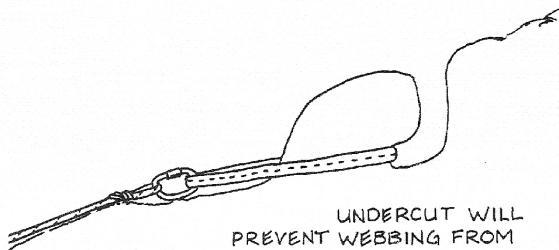
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## ICE SCREW ANCHOR



CHOP A SMALL LEDGE FOR THE EYE TO REST AT THE PROPER ANGLE, FLUSH AGAINST THE ICE.

## SNOW BOLLARD ANCHOR

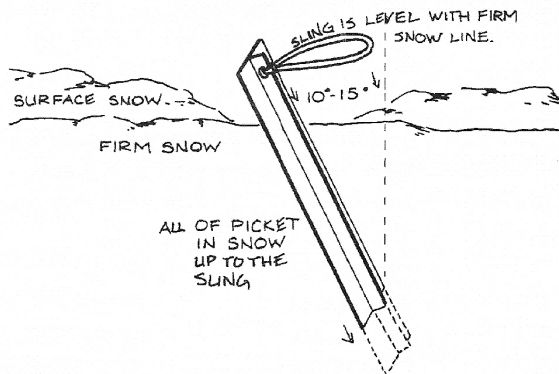


UNDERCUT WILL  
PREVENT WEBBING FROM  
WORKING UPWARDS

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## SNOW PICKET ANCHOR



CLEAR AWAY SOFT SURFACE SNOW  
TO INSURE THE PICKET IS IN FIRM  
SNOW.

## Erecting Tents at Snow Camps

If it is a windy day or if the camp is at a windy location, field teams may need to construct snow walls before setting up a tent. Snow walls, which are constructed with blocks cut from the snow, shelter tents from wind. Ideally, blocks are cut with a saw in hard-packed snow, but a shovel or ice ax may work. Since snow conditions can change over a small area, probe the snow to see if there is an area harder than others. If there is only soft snow, it can be packed down with boots to see if it hardens (sinters) after an hour or more.

## Erecting Tents on Sea Ice

If the snow on the ice is deep enough, anchor the tent as described above. Otherwise, clear off any snow and anchor the tent to the ice with ice screws. Team members may also drill V-threads (two holes that intersect to form a V-shaped channel), then use an ice screw or ice drill to feed a guy line through the channel. It helps to feed it to the bottom of the V on one side, then insert an ice screw on the other side. Twist the ice screw, and the teeth should grab the line and pull it out as the ice screw is withdrawn from the hole. The line can then be attached to the tent.

## Erecting Tents on Soil

If the soil is not frozen, anchor the tent by digging deep trenches for deadman anchors. There should be one anchor for every tie-off point on the tent. Care should be taken when camping in sandy locations, as many deadmen will be required to anchor the tent properly for windy conditions. If temperatures are below freezing, fresh water can be poured on the anchors to freeze them and the soil in place. Large boulders can provide a wind break, and large rocks or stacks of rocks can be used as anchors. If the field team is using metal stakes for anchors, it may take several minutes to sledge hammer each one into frozen soil. If the team intends to move camp, members should take extra anchors, as it may be difficult to remove some of the stakes from the frozen soil.

## Camp Medical Protocols

Before arriving at the camp, team members should discuss relevant medical concerns with the appointed field safety/medical lead. The ASC camp manager (if there is one) will most likely be in control of the medical kit. Any medical interventions at camp involving more than basic First Aid must be coordinated by the medical lead with the

Palmer Station physician. Make sure everyone is familiar with the contents of the medical kit, knows the location of medical supplies, and knows what to do in case of a medical emergency.

## Camp Hygiene

Preventing illness within the camp is crucial for ensuring the team's success and eliminating the risk of a serious illness requiring a medevac. Practice proper hygiene to minimize pathogen transmission, and keep drinking water clean.

- Designate a hand-washing area in camp.
- Wash hands after using the bathroom, before cooking and eating, before cleaning up after meals, and at other times during the day. Have hand sanitizer easily accessible in the toilet tent and at other locations around camp.
- Protect drinking water from motor exhaust and microbial contamination.
- Use filters, chlorine, iodine, or boiling to disinfect water, as needed.
- Designate certain equipment for water collection (containers, shovels, ice axes) and don't use it for anything else. Or, sterilize the equipment before using it to collect snow or ice for water.
- Clean and disinfect drinking water storage containers regularly.
- Use bleach to sterilize dishwater and dishes.

## Drinking water

Depending on the location of the camp, there may be access to fresh drinking water. Any fresh water from a lake, stream, glacier, or snow will need to be filtered, sterilized with chlorine (household bleach), or boiled. The Peninsula field supervisor will determine if your campsite has a reliable fresh water source and provide filtration and sterilization materials.

The fresh water source may need to be supplemented, or it may be that a fresh water source is not available. In these cases, bottled water will be supplied in five- or six-liter bottles purchased in Punta Arenas. The Peninsula field supervisor will calculate the appropriate amount of bottled water needed for the group, including an emergency stash in case camp resupply or pull-out is delayed. Practicing water conservation at camp is important, and maintaining a rolling inventory of bottled water throughout the field season is helpful.

## Fire Prevention

Fire prevention is crucial in remote camps. Losing supplies or shelter to fire can immediately create an emergency situation. In Punta Arenas, make sure all field team members know how to operate stoves, lamps, heaters, and generators properly.

- Be aware of and minimize hazards in areas where combustible equipment is set up.
- Ensure all equipment remains in proper working order throughout the field season.
- Small propane heaters should only be placed on aluminum tables.
- Check propane cylinders for damage or leaks before using them.
- Propane cylinders should be stored outside the tent as much as possible, with long propane hoses running from the tank to the inside of the tent where the stove or heater is located.
- Release pressure in any liquid fuel canisters outside the tent before packing or storing them.
- Operate and store generators at least 50 feet away from any tent.
- Do not dry clothing on a heater or stove. Use a clothespin to hang wet clothing on a string inside the tent.
- Line the inside of the tent behind the cooking stove with foil so the tent is not splattered with cooking grease and becomes a fire hazard. Change the foil frequently. Foil also helps protect the tent fabric from burning or melting.
- Fire extinguishers, CO detectors, and smoke detectors are standard issue for field camps. Place them in appropriate and accessible areas and make sure all field team members know their location and proper use.

## Rest/Duty Cycles

Antarctic field research opportunities are precious. It is tempting to burn the candle at both ends in order to accomplish project objectives. However, when individuals become extremely tired, their awareness level can decrease and their stress level can increase. Exhaustion can cause the following problems:

- Compromised work quality
- Deterioration of personal relations
- Lapses in judgment

- Decreased awareness of safety (situational and self-awareness)
- Behavioral changes that put the individual or team at risk

Create a work schedule that encompasses research duties, camp responsibilities, and rest time. Divide camp responsibilities as equally or sensibly as possible. Prioritize work objectives and complete them accordingly. Encourage individuals to be responsible for their own well-being and take advantage of rest periods as necessary. Camp set-up and maintenance should take priority.

## Lifting and Carrying

Manual material handling tasks performed repeatedly or over long periods of time can lead to fatigue and injury. The main risk factors associated with these injuries are:

- Awkward postures (bending, twisting)
- Repetitive motions (frequent reaching, lifting, carrying)
- Forceful exertions (carrying or lifting heavy loads)
- Pressure points (grasping loads or contact with parts or surfaces that are hard or have sharp edges)
- Static postures (maintaining a fixed position for a long time)

### Guidelines for Safe Lifting

- Before lifting, always test the load for stability and weight.
- Plan the lift:
  - Wear appropriate footwear to avoid slips, trips, or falls.
  - If you wear gloves, choose a size that fits properly. Depending on the glove material and the number of pairs worn at once, more force may be needed to grasp and hold objects. Wearing a single pair of gloves can reduce grip strength up to 40 percent. Wearing two or more pairs can reduce grip strength up to 60 percent.
  - Lift only as much as you can safely handle by yourself.
  - Keep the lifts in your power zone (i.e., above the knees, below the shoulders, and close to the body), if possible.
  - Use extra caution when lifting unstable loads.
- When lifting:
  - Get a secure grip.
  - Use both hands whenever possible.
  - Use smooth, even motions.
  - Keep the load as close to the body as possible.

- To the extent feasible, use your legs rather than the upper body or back to push up and lift the load.
- Do not twist your body. Step to one side or the other to turn.

Alternate heavy lifting or forceful exertion tasks with less physically demanding tasks.

## Camp Pull-Out

The camp pull-out schedule must be coordinated with the MPC, who will confer with the vessel captain and other stakeholders. The field supervisor or field team member assigned to communications is responsible for providing all requested information to the incoming vessel. This person should know the condition of the landing site and the current wind, sea, and ice conditions. Any animal activity that will impact operations should be noted as well.

In addition, the field team must provide detailed information regarding the weight, dimensions, and type of returning (retrograde) cargo, and the specifics of any scientific samples, such as Keep Frozen and/or Do Not Freeze.

All of this information will greatly aid in preparations for pulling out the camp.

The pull-out procedure is similar to the put-in, but in reverse. The field camp must be entirely broken down. All gear except for life-essential materials must be packaged, staged, and ready for quick loading when the vessel arrives. Pack all non-essential gear, equipment, and waste in waterproof packaging. Life-sustaining supplies should be loaded last.

## Field Team Tasks on Vessel

There are many tasks to perform on the vessel after returning from the field. These include drying sleeping bags and tents by hanging them in the Baltic Room, storing food properly, cleaning gear by scrubbing and washing it on the deck with hoses and brushes, cleaning generators and emptying fuel, and labeling broken or damaged equipment. Work with the field supervisor or MPC for a full list of tasks, and refer to the pull-out procedures checklist at the beginning of this manual.